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(71) Applicant (for all designated States except US): HIB PROMOTION AB [SE/SE]; Drottningtorget 2, S-211 25 Malmö (SE).					
(72) Inventor; and					
(75) Inventor/Applicant (for US only) : BÖRRESEN, Hans, Jan [NO/SE]; Scaniagatan 15, S-216 18 Malmö (SE).					
(74) Agents: KINBERG, Tage et al.; Sydsvenska Patentbyrå AB, Drottningtorget 1, S-211 25 Malmö (SE).					
(54) Title: METHOD AND APPARATUS FOR FASTENING HOLLOW SECTIONS TOGETHER BY MEANS OF CONNECTION PIECES					
(57) Abstract					
<p>Method of fastening hollow sections, preferably hollow sections which are to form casements or window or door frames, to one another by means of connection pieces, each such connection piece (5) comprising two limbs (5a, 5b) one of which (5a) is adapted to engage one hollow section (3), while the other limb (5b) engages the other hollow section (4). To enable fixation of the hollow sections and the connection piece to one another quickly and efficiently by means of adhesive without the latter coming in contact with the surroundings, the method of the invention is characterized by moving the hollow sections (3, 4) together until the end edges thereof abut to form a space in the hollow sections which is closed at the connection point (30) between the hollow sections (3, 4) and which contains the connection piece (5), applying at least one nozzle to the outer sides of one or both hollow sections (3, 4) in connection with one or more holes (44) in said outer sides, and injecting the adhesive (42) via the nozzle and the hole (44) into spaces between the sides (5d, 5e) of the two limbs (5a, 5b) of the connection piece (5) and the hollow section portions adjoining said sides (5d, 5e), without the adhesive coming in contact with the surroundings. An apparatus suitable for the performance of this method int.al. permits holding the hollow sections (3, 4) during various operating cycles.</p>					

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Method and apparatus for fastening hollow sections together by means of connection pieces.

This invention relates to a method of fastening hollow sections, preferably hollow sections which are to form casements or window or door frames, to one another by means of connection pieces, each such connection piece having two limbs 5 one of which is adapted to engage one hollow section while the other limb engages the other hollow section. Moreover, the invention relates to an apparatus for practising the said method.

Many different problems are encountered if one wishes to 10 make use of adhesives for joining connection pieces in hollow sections to said hollow sections. One problem is that it takes a long time to apply adhesive to the connection piece, especially if one wants to apply the adhesive over large adhesion surfaces on several of the sides of the connection piece. Such an application 15 in fact is so time-consuming that quick-drying or quick-setting adhesive cannot be utilised because of the risk that the adhesive has dried or set before the connection piece has been brought in position in the hollow sections. Another problem is that it is difficult to hold the connection piece during 20 application of the adhesive and that it is difficult to avoid getting oneself and one's work place all soiled with adhesive. A further problem is that it is difficult to avoid exposing oneself to adhesive fumes, and to place the connection piece in the hollow sections without wiping the adhesive off the connection 25 piece.

One object of the present invention is to provide a method of eliminating these problems. The main characterising features of the method of the invention will appear from appendant claim 1.

30 Another object of the invention is to provide a simple apparatus for carrying out the method of the invention. The main characterising features of the apparatus will appear from appendant claim 9.

The method of the invention permits spreading the adhesive 35 very rapidly over large surfaces on several of the connection piece sides simultaneously, while preventing that the operator comes in contact with the adhesive or is exposed to adhesive

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fumes. As a result, use can be made of quick-drying or quick-setting adhesives. Besides, it will no more be necessary to introduce into the hollow sections a connection piece to which adhesive has been applied.

5 The apparatus according to the invention permits a rational and reliable supply of adhesive.

The invention will be more fully described in the following with reference to the accompanying drawings in which:

10 Figure 1 is a diagrammatic plan view of an apparatus for carrying the method of the invention into effect;

figure 2 shows a part of the apparatus according to Figure 1 during a first phase of the manufacturing process;

Figure 2A shows relative positions of hollow sections and a connection piece during the phase shown in Figure 2;

15 Figure 3 shows the said part of the apparatus during a second phase;

Figure 3A shows relative positions of the hollow sections and the connection piece during the second phase;

20 Figure 4 shows the said part of the apparatus during a third phase;

Figure 4A shows the hollow sections and the connection piece after holes have been made therein;

Figure 5 shows the said parts of the apparatus during a fourth phase; and

25 Figure 5A shows the hollow sections and the connection piece after supply of adhesive.

The apparatus illustrated in Figure 1 for carrying the method of the invention into effect mainly comprises a machine frame 1 with a holding assembly 2 for assembling and holding two hollow sections 3, 4 and a corner piece 5. The corner piece 30 5 is held to a plate 6 with the aid of a holding means 7 which is compressed air operated and for this reason is connected to a compressor 11 via a conduit 8, a control device 9 and a conduit 10. The plate 6 has guiding and clamping means 12 and 35 13 for the hollow sections 3 and 4. Having been placed in the guiding and clamping means 12, 13, the hollow sections are moved by manual or mechanical force towards the corner piece 5 and passed thereonto until their obliquely cut edges 3a, 4a abut. The corner piece 5 is then completely enclosed in the

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hollow sections 3, 4. The relative positions of the various parts 3, 4 and 5 will appear from Figure 3.

When the hollow sections 3, 4 and the corner piece 5 have been assembled, the holding means 7 is moved away from the holding assembly 2 on rails 14, 15 provided for that purpose. Instead, a slide 16 also mounted on the rails 14, 15 is moved to a position opposite the holding assembly 2. The slide 16 comprises an upsetting assembly 17 having two mandrel holders 18, 19 with compressed air operated mandrels 20, 21. For the operation of the mandrels 20, 21 the mandrel holders 18, 19 are connected via conduits 22, 23 to the control device 9 which in turn is connected to the compressor 11 via the conduit 10. Furthermore, the slide 16 comprises a hole drilling assembly 24 consisting for example of a compressed air operated drilling machine 25 having a drill 26. For driving the drill 26 the drilling machine 25 is connected via a conduit 27 to the control device 9 and via the latter and the conduit 10 to the compressor 11. The hole drilling assembly 24 may alternatively comprise two drilling machines 28, 29 set at an angle to each other, if it is desired to drill holes in each hollow section 3, 4 instead of drilling holes with the drilling machine 25 in the corner edge 30 formed by the obliquely cut edges 3a, 4a of the two hollow sections 3, 4 when the hollow sections 3, 3 are assembled. The drilling machines 28, 29, their drills 31, 32 and their conduits 33, 34 leading to the control device 9 are shown by dash and dot lines in Figure 1.

After upsetting and hole drilling the slide 16 with the upsetting and hole drilling assemblies 17 and 24, respectively, is moved away from the holding assembly 2 and instead an adhesive supplying assembly 35 is moved to a position opposite the holding assembly 2. The adhesive supplying assembly 35 comprises a container 36 for adhesive, a nozzle for passing adhesive through the hole or holes of the hollow sections 3, 4 and a conduit 38 by which the container 36 is connected to a pump 39 for adhesive. The said pump is connected via a conduit 40 to the control device 9 and adapted to discharge adhesive through the nozzle 37 under a suitable and, if required, variable pressure. The conduit 40 in its turn comprises a control device 41 for controlling the adhesive pump 39 in such

a way as to dispense adhesive at suitable intervals to the container 36 from an adhesive supply 43 containing an adhesive 42.

The two hollow sections 3, 4 to be assembled so as to form 5 a corner, are made of metallic material and have a cross section in the form of a substantially quadrilateral tube 3b, 4b with or without protruding portions (see Figure 2A). The corner piece 5 also is of metallic material and comprises two limbs 5a and 5b whose cross section also is in the form of a quadri- 10 lateral tube. The limbs 5a and 5b are so dimensioned as to fit in the tubular parts 3b, 4b of the hollow sections 3, 4. The two limbs of the corner piece 5 are formed with a plurality of channels 5f, 5g in their sides 5d, 5e constituting an outer corner edge 5c. The said channels are adapted to conduct adhesive 15 42.

For the mounting of the hollow sections 3, 4 and the corner piece 5, the hollow sections 3, 4 are placed in their guiding and clamping means 12 and 13, respectively, and the corner piece 5 is brought in position on the plate 6. The hollow sections 3, 20 4 are displaced in the direction of the arrows A and B in Figure 2 until they have been passed onto the corner piece 5 and their obliquely cut edges 3a, 4a abut (see Figure 2). Thereafter the holding means 7 is moved backwards in the direction of arrow C in Figure 3 and laterally in the direction of arrow D in Figure 25 4. Instead, the slide 16 with the upsetting assembly 17 is moved to its working position which is shown in Figure 4. The mandrels 20, 21 are activated so as to urge portions of the outer sides of the hollow sections 3, 4 into recesses of the corner member (for instance depressions inside of raised end 30 portions 5h, 5k of the corner piece 5) or only against the corner piece 5 so that the hollow sections 3, 4 and the corner piece 5 cannot be dislodged in relation to each other. Then the drilling machine 25 is activated so that its drill 26 is caused to drill a hole 44 through the outer corner edge 30 of the 35 hollow sections 3, 4 (see Figures 4A and 5A) such that the hole 44 communicates with both the channels 5f and the channels 5g in the limbs 5a and 5b of the corner piece 5. When the hole 44 has been drilled the slide 16 is moved in the direction of arrow E in Figure 5 and the adhesive supplying assembly 35 is

moved into working position in the direction of arrow F in Figure 5, whereupon the nozzle 37 is connected to the hollow sections 3, 4 for conducting adhesive 42 into the hole 44 (see Figure 5). Then the pump 39 is started. It urges adhesive 42 5 from the adhesive supply 43 into the hole 44 and via said hole into the channels 5f and 5g. The adhesive 42 may preferably be supplied at such a pressure that it penetrates into the space between the hollow sections 3, 4 and the sides 5d and 5e of the corner piece 5. As the channels 5f and 5g are not open 10 towards the end portions of the corner piece 5 but instead towards the other sides 5l, 5m, 5p, 5q, 5r and 5s, of the corner piece 5, the adhesive by being supplied at an adequate pressure will be distributed in the spaces between all inner sides of the corner piece 5 and the surrounding sides of the 15 hollow sections 3, 4. It has been indicated by broken lines in Figure 5A how the adhesive 42 has spread to the space between all outer sides of the corner piece 5 and the surrounding inner sides of the hollow sections 3, 4. By such a supply of adhesive 42 all interspaces can be momentarily filled out and, as a 20 consequence, the bond between the hollow sections 3, 4 and the corner piece 5 will be very strong. As the obliquely cut edges 3a, 4a of the hollow sections 3, 4 abut, for instance under pressure, the adhesive 42 is prevented from penetrating between them. Besides, the method described does not allow 25 the adhesive to come in contact during its supply with the surroundings int.al. because the space for the corner piece 5 within the hollow sections 3, 4 is closed by the abutting end edges of the hollow sections 3, 4. Thus, ambient air cannot in any way influence the adhesive and the personnel is not 30 exposed either to adhesive or injurious gases which might arise if the adhesive comes in contact with air.

Use can be made as adhesive for instance of various types of glue products, depending upon the shape or the material of the hollow sections 3, 4 and the purpose for which they are 35 to be used. In many cases preference is given to a quick-drying glue, particularly a quick-setting multicomponent glue. The adhesive preferably is of a type such that it retains its volume or expands slightly upon drying or setting so that it fills out the respective spaces also after drying or setting.

40 The apparatus illustrated and the method described above

aim at elucidating the inventive idea, not at restricting it. Thus, the apparatus and the method can be utilised for the connection of hollow sections of types other than for casements, window or door frames. As an alternative filed of 5 application mention may be made of signboard frames. The apparatus and the method are not either limited to the connection of hollow sections to provide a corner, but can be used for the connection of hollow sections to form a straight section bar. In this instance, the corner piece is replaced by a 10 straight connection piece.

As for the apparatus, the holding assembly 2 - as an alternative of what is mentioned in the foregoing - may be movable in relation to the other assemblies 17, 24 and 35, or all 15 assemblies 2, 17, 24 and 35 may be movable in relation to each other. The apparatus may also be employed only for the fixation of a hollow section 3 or 4 to a corner piece or other connection piece, whereupon another hollow section can be fixed to the corner piece or the connection piece in another manner. As a further alternative it may be mentioned that the corner piece 20 or the connection piece may be a holder for fixation of the hollow section in a suitable manner.

Instead of one hole 44 in the corner edge 30 there may be arranged several holes in said corner edge 30, in which case each such hole preferably communicates with a channel or a 25 system of channels in the connection piece 5. As an alternative of or in combination with the hole 44 or the holes in the corner edge 30 each hollow section 3, 4 may be provided with one or more holes. The lastmentioned holes are drilled by means of the drilling machines 28, 29 preferably at a distance 30 from the corner edge 30 and preferably at such places where they communicate with inside channels in the connection piece 5.

It is advantageous but in some cases not absolutely necessary to distribute the adhesive via channels in the connection piece. As an alternative, the adhesive may also be efficiently distributed 35 by conducting it into narrow slit-shaped spaces between the hollow sections and the connection piece.

It may finally be mentioned that the hollow sections and the connection piece may be of metal, plastics or other suitable material. Their shape may deviate considerably from the

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shape illustrated, depending upon the purpose for which they are to be used. Furthermore, the upsetting procedure and the upsetting assembly therefor may possibly be dispensed with, as the adhesive connection in many cases ensures a fully sufficient durability.

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Claims:

1. A method of fastening hollow sections, preferably hollow sections which are to form casements or window or door frames, to one another by means of connection pieces, each such connection piece (5) comprising two limbs (5a, 5b) one of which 5 (5a) is adapted to engage one hollow section (3) while the other limb (5b) engages the other hollow section (4), characterised by moving together the hollow sections (3, 4) until the end edges thereof abut to form a space in said hollow sections which is closed at the connection point (30) 10 between the hollow sections (3, 4) and which contains the connection piece (5), applying at least one nozzle against the outer sides of one or both hollow sections (3, 4) in connection with one or more holes (44) in said outer sides, and injecting adhesive (42) via the nozzle and the hole (44) into 15 the spaces between the sides (5d, 5e) of the two limbs (5a, 5b) of the connection piece (5) and the hollow section portions adjoining said sides (5d, 5e), without any contact between the adhesive and the surroundings.
2. A method as claimed in claim 1, characterised by injecting the adhesive (42) through holes (44) in the hollow sections (3, 4) at such points and at such a pressure 20 that the adhesive is distributed to more than one of the surfaces of the connection piece (5) which are directed outwardly towards the inner sides of the respective hollow section (3 and 25 4).
3. A method as claimed in any one of the preceding claims, characterised by injecting the adhesive (42) through a hole or holes (44) so placed in the hollow section or sections (3, 4) that the adhesive is distributed through distribution 30 channels (5f, 5g) arranged in the connection piece (5) preferably in such a way that the adhesive (42) is distributed along a plurality or all of the sides of the connection piece (5).
4. A method as claimed in any one of the preceding claims, the hollow sections (3, 4) being adapted to form a corner and 35 the connection piece being a corner piece (5) having a limb (5a) adapted to engage a hollow section (3), while another limb (5b) engages another hollow section (4), characterised by injecting the adhesive (42) through at least one hole

(44) in an outer corner edge (30) formed by the two hollow sections (3, 4), whereby adhesive (42) can be caused to penetrate between one limb (5a) of the corner piece (5) and one hollow section (3) as well as between the other limb

5 (5b) of the corner piece (5) and the other hollow section (4).

5. A method as claimed in any one of claims 1 - 3, the hollow sections (3, 4) being adapted to form a corner and the connection piece being a corner piece (5) having a limb (5a) adapted to engage a hollow section (3), while another limb
10 (5b) engages another hollow section (4) *characterised* by injecting the adhesive (42) through at least one hole in one hollow section (3) into a space between said section and one limb (5a) of the corner piece (5) and through at least one other hole in the other hollow section (4) to the other limb
15 (5b) of the corner piece (5).

6. A method as claimed in any one of the preceding claims, *characterised* by injecting adhesive (42) through the hole (44) while the hollow sections (3, 4) with the connection piece (5) therein are held in a device which is also
20 adapted to make the hole (44).

7. A method as claimed in any one of the preceding claims, *characterised* by injecting adhesive (42) in the form of a quick-drying or quick-setting multicomponent glue with expanding properties when dried or set between the connection
25 piece (5) and the hollow section or sections (3, 4) through holes (44) in said section or sections.

8. An apparatus for performing the method of fastening hollow sections, preferably hollow sections which are to form casements or window or door frames, to one another by means of
30 connection pieces, each such connection piece (5) comprising two limbs (5a, 5b), one of which (5a) is adapted to engage one hollow section (3) while the other limb (5b) engages the other hollow section (4), as claimed in claim 1, *characterised* by a holding assembly (2) for holding the hollow
35 sections (3, 4) and the corner piece (5) in a final assembled state during the making of holes in the hollow section or sections (3, 4) by means of a hole drilling assembly (24), during the injection of adhesive (42) through the hole or holes (44) by means of an adhesive supplying assembly (35) and possibly, before
40 the drilling of holes, during the upsetting by means of an up-

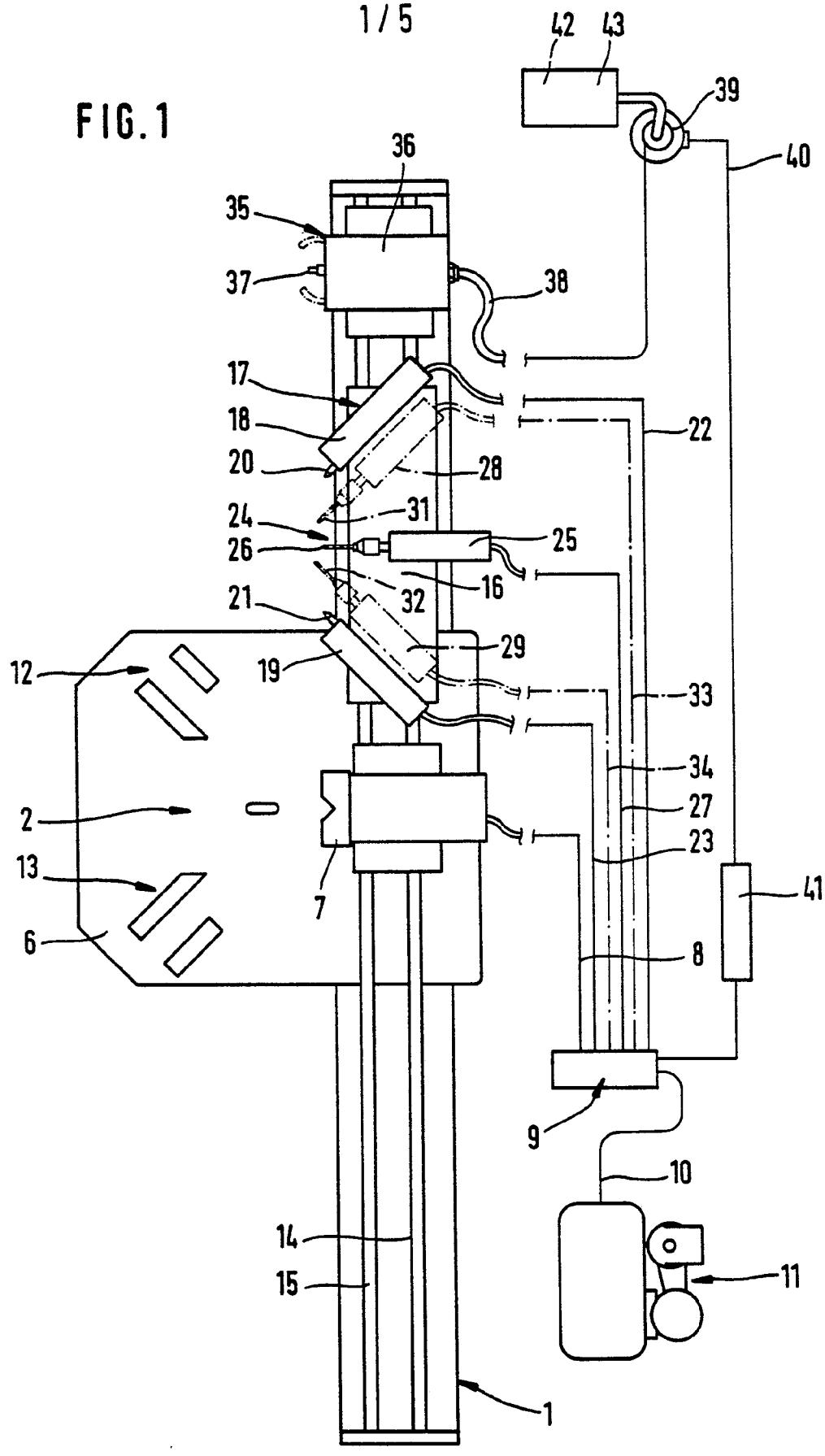
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setting assembly (17) to fix the connection piece (5) and the hollow section or sections (3, 4) in relation to one another by upsetting portions of the hollow section or sections (3, 4) inwardly towards the corner piece (5).

5 9. An apparatus as claimed in claim 8, characterised in that the hole drilling assembly (24) and the adhesive supplying assembly (35) and possibly the upsetting assembly (17) are movably mounted on a machine part (1, 14, 15) for permitting shifting of the assemblies (24, 35 and possibly 10 17) in relation to the holding assembly (2), and/or the holding assembly (2) is movable in relation to the other assemblies (24, 35 and possibly 17), and/or all assemblies (2, 24, 35 and possibly 17) are movable in relation to one another.

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FIG. 1



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FIG. 2

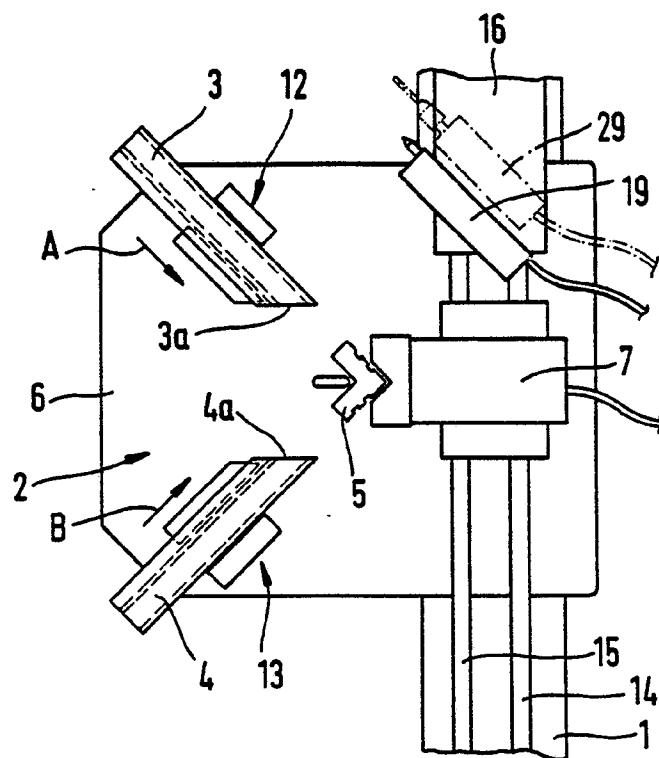
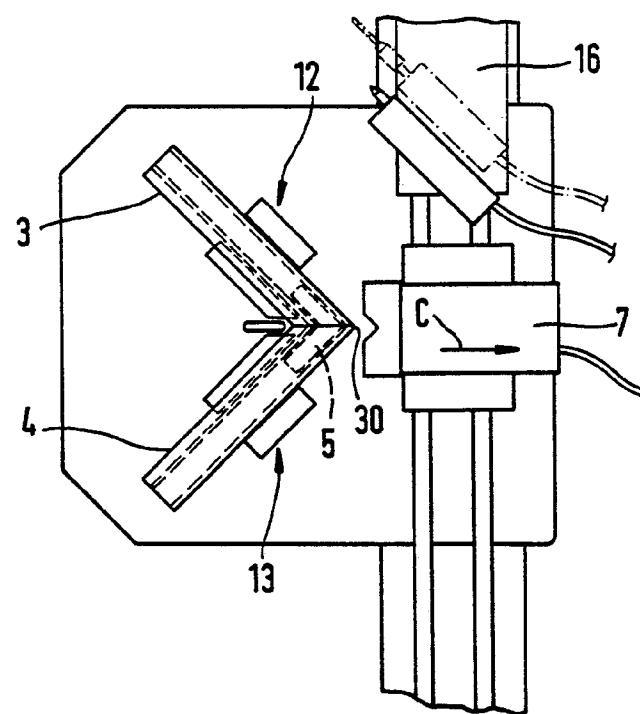


FIG. 3



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FIG. 2A

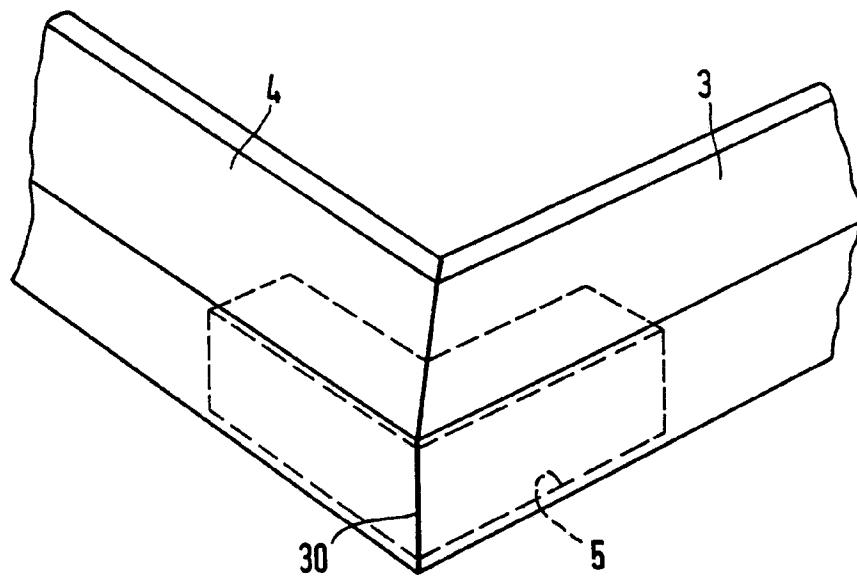
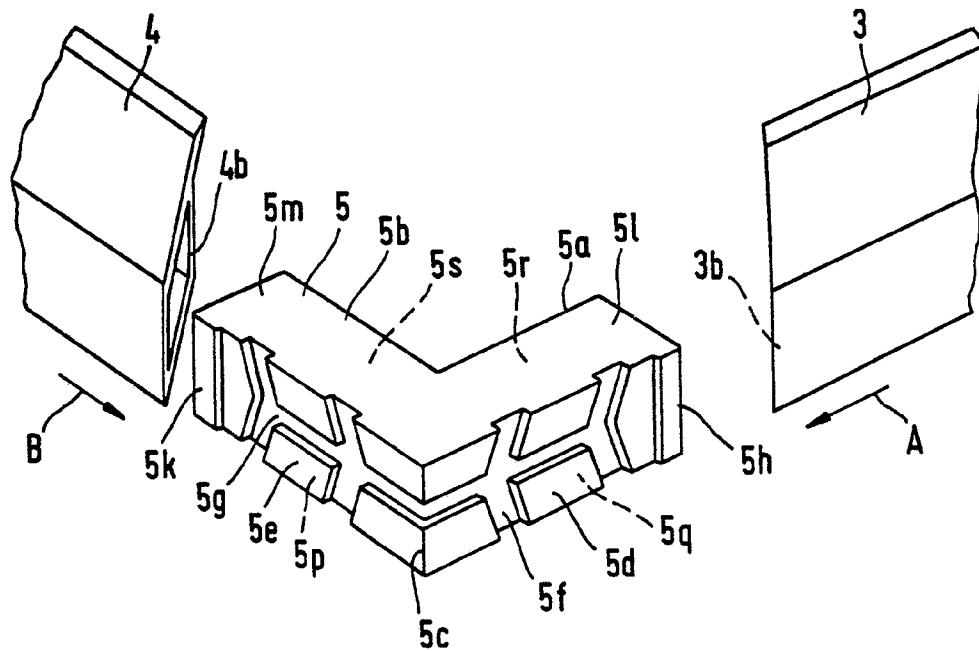


FIG. 3A

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FIG. 4

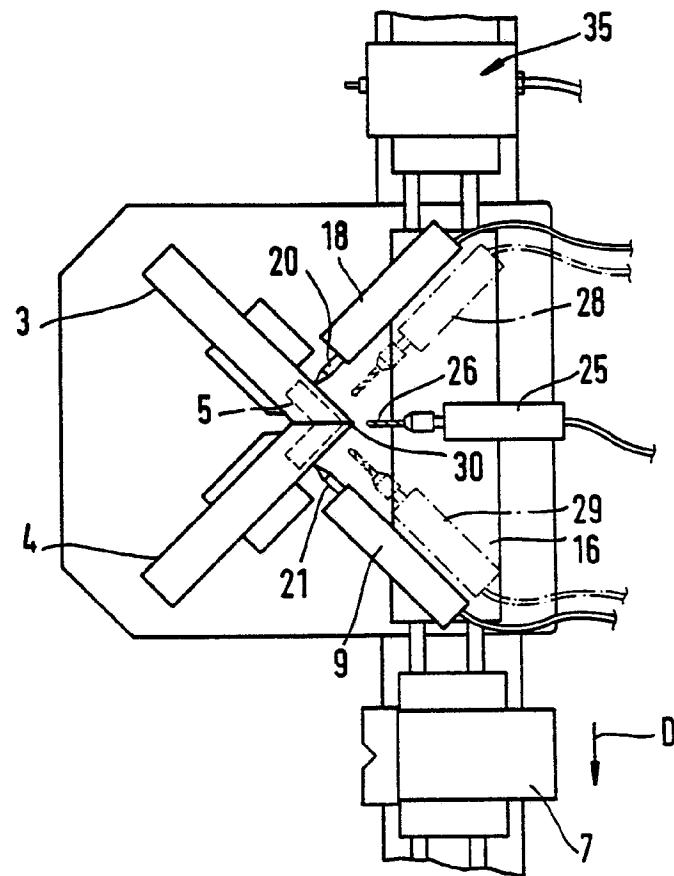
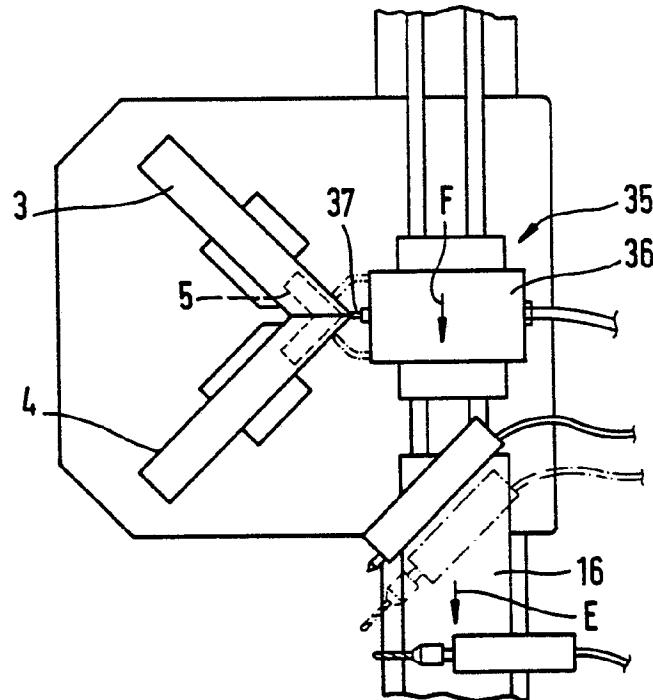


FIG. 5



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FIG. 4A

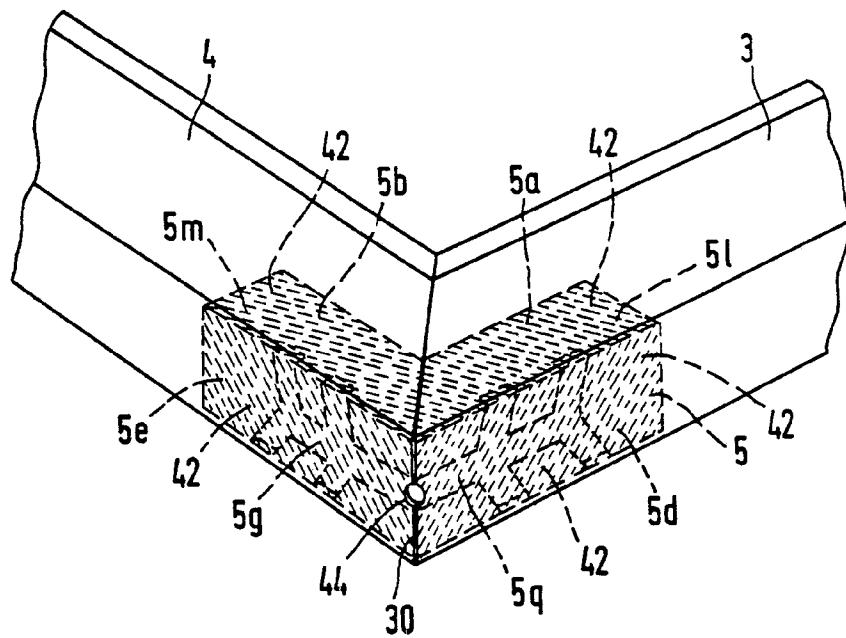
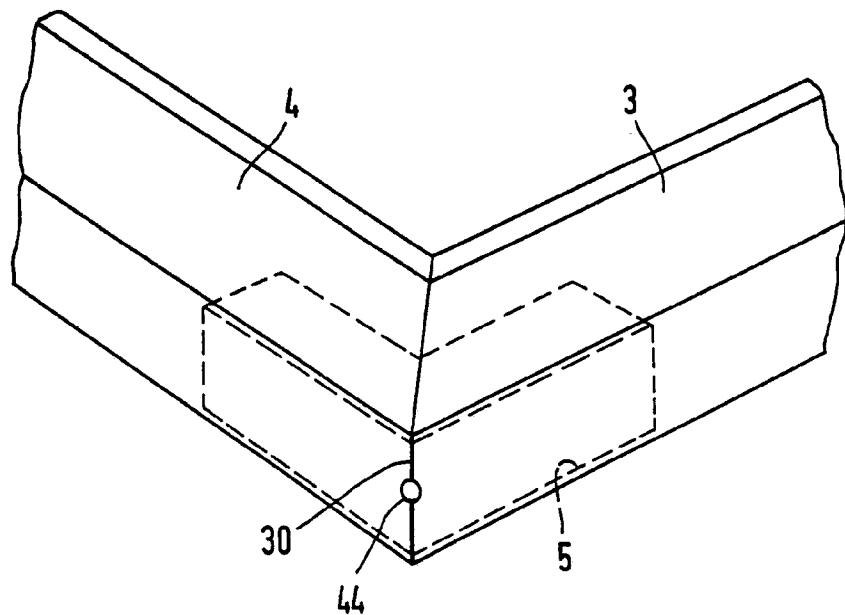


FIG. 5A

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INTERNATIONAL SEARCH REPORT

International Application No PCT/SE86/00358

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC 4

E 06 B 3/96, B 21 D 53/74

II. FIELDS SEARCHED

Minimum Documentation Searched ?

Classification System	Classification Symbols
IPC 4	E 06 B 3/00, /04, /66, /96
US Cl	52: 656, 753, 758; 403: 231, 289-297, 401

Documentation Searched other than Minimum Documentation
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SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT*

Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	SE, B, 438 704 (SAINT-GOBIN) 29 April 1985 corresponds to SE, A, 8005047 10 January 1982	1
Y	DE, A1, 2 757 886 (KOHNEN F) 28 June 1976 & AT, 365957	1
A	DE, A1, 2 500 937 (DIEHM W) 15 July 1976	
A	WO, A1, 82/02572 (SCHMIDLIN H) 5 August 1982	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

1986-10-22

Date of Mailing of this International Search Report

1986 -10- 23

International Searching Authority

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Signature of Authorized Officer

Leif Törn